REMARKS

The drawings have been objected to because reference numerals 51 and 52 are shown in the drawings but not mentioned in the description.

Claim 10 has been objected to for an informality.

Claims 1-4, 6-13, and 16-17 have been rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent Appl. Pub. No. 2002/0057057 (Sorg) in view of U.S. Patent No. 6.130,448 (Bauer).

Claims 5, 14, and 15 have been rejected under 35 U.S.C. §103(a) as unpatentable over Sorg in view of Bauer, and further in view of U.S. Patent No. 5,556,809 (Nakagawa).

Status of the claims

Claims 1 and 10 have been amended.

Claims 1-17 remain pending.

Objection to the drawings

The Office Action states that the drawings have been objected to because reference numerals 51 and 52 are shown in the drawings but not mentioned in the description.

The drawings have been amended to remove the reference numerals 51 and 52. Applicant submits that this objection has been overcome.

Objection to claim 10

Claim 10 has been objected to because the term "the connecting layer" should be the term "the composition".

Claim 10 has been appropriately amended. Applicant submits that this objection has been overcome.

Rejection of claims 1-4, 6-13, and 16-17 under 35 U.S.C. §103(a)

The Office Action states that the combination of Sorg and Bauer teaches all of Applicant's recited elements.

Independent claim 1 has been amended for clarity. No new limitations have been introduced. Independent claim 1 now recites an optoelectronic module that includes a carrier element that has electrical connection electrodes and electrical lines. The module further includes at least one semiconductor component for emitting or detecting electromagnetic radiation. The semiconductor component is applied on the carrier element and is electrically connected to the connection electrodes of the carrier element and has a radiation coupling area. The module still further includes at least one optical device assigned to the semiconductor component, and a connecting layer made of a radiation-transmissive, deformable material arranged in a gap between the radiation coupling area and the optical device. The optical device and the semiconductor component are fixed relative to one another and pressed against one another to squeeze the connecting layer arranged therebetween. The squeezed connecting layer, when squeezed, is configured to generate an opposing force that strives to press the optical device and the radiation coupling area apart.

Sorg and Bauer, whether taken alone or in combination, fail to teach or suggest "wherein the optical device and the semiconductor component are fixed relative to one another and pressed against one another to squeeze the connecting layer arranged therebetween" and "wherein the connecting layer, when squeezed, is configured to generate an opposing force that strives to press the optical device and the radiation coupling area apart", as recited in Applicant's claim 1.

According to Applicant's invention, "pressed against one another" means that the optical device 3 and the semiconductor component 2 are held permanently in a state pressed against one another by a fixing device (i.e., mounting bars 8 and nuts 9) to squeeze, and consequently deform, the connection layer 6 (see paragraph [0010] of Applicant's published specification). The connection layer 6, in response to being squeezed by the optical device 3 and semiconductor component 2, generates an opposing force that pushes back against the semiconductor component 2 and the optical device 3 in an attempt to push the optical device 3 away from the radiation coupling area 16 of the semiconductor component 3 (see paragraph [0011] of Applicant's specification).

The connecting layer 6 is configured in such a way that the force that it generates prevents to the greatest possible extent any formation of air gaps between the connecting layer and the adjoining interfaces. This applies in particular to an entire operating temperature range of the module and to any action of additional deforming forces on the connecting layer, such as, for instance, vibrations or centrifugal forces (see paragraph [0012] of Applicant's specification).

Accordingly, the connecting layer 6 includes a material which has a higher strength than a conventional gel and which is not flowable over the entire operating temperature range of the optoelectronic module. (see paragraph [0013] of Applicant's specification).

Thus, Applicant's recited invention can effectively compensate for fluctuations in the

distance between the semiconductor component and the optical device, which may occur because of temperature fluctuations in combination with materials of the semiconductor component and the optical device having different expansion coefficients. If the distance between the optical device and the semiconductor component increases, the compressed connecting layer expands and thus minimizes the risk of an air gap forming between the semiconductor component and the radiation coupling area. (see paragraph [0014] of Applicant's specification).

As mentioned above, neither Sorg nor Bauer teach or suggest an optical device and a semiconductor component fixed relative to one another and <u>pressing</u> against one another <u>to squeeze</u> a connecting layer arranged therebetween, or that the connecting layer, when squeezed, is <u>configured to generate an opposing force</u> that strives to press the optical device and the radiation coupling area apart", as recited in Applicant's claim 1.

Sorg discloses an LED light source that includes a lead frame 5 and body 1 with a recess 1A in which a liquid resin filling 3 is disposed. The LED light source of Sorg further includes a lens 4 disposed in the recess 1A such that the resin filling 3 is displaced in the recess 1A to accommodate the lens 4 and thus disposed between lens 4 and the lead frame 5 and/or the LED 2 (see Fig. 2 and paragraphs [0046] and [0049] of Sorg).

The Examiner cites Fig. 2 and paragraph [0046] of Sorg as teaching that the LED 2 and lens 4 of Sorg are fixed relative to one another, and that the resin filling 3 (which allegedly corresponds to Applicant's connecting layer) is disposed therebetween and fixed relative to the LED 2 and the lens 4. The Examiner, however, fails to cite any portion of Sorg as teaching an optical device and a semiconductor component <u>pressing</u> against one another <u>to squeeze</u> a connecting layer arranged therebetween, or that the connecting layer, when squeezed, is

configured to generate an opposing force that strives to press the optical device and the radiation coupling area apart", as recited in Applicant's claim 1.

Nevertheless, nothing in the cited passages of Sorg or anywhere in the disclosure of Sorg teaches or suggests that the lens 4 and the LED 2 are pressed together to squeeze the resin filling 3. Instead, the resin 3 of Sorg simply sits on top of the LED 2, and the lens 4 sits on top of the resin 3. As described above, the resin 3 of Sorg is simply displaced within the recess 1A to accommodate the lens 4.

Further, there is nothing disclosed in Sorg that teaches or suggests that the resin is compressed or generates a force opposing the compression, which presses back against the LED 2 and the lens 4. Sorg simply teaches that the forces applied to the LED 2, the resin 3, and the lens 4 are in a state of equilibrium.

Specifically, Sorg states that "[t]he amount of resin material 3 with which the recess 1A is filled must be set as accurately as possible in such a way that the missing volume up to the rim of the recess 1A corresponds to the displacement volume of the section of the lens 4 forming the concave underside 4A" (see paragraph [0050] of Sorg). After the insertion of the lens 4 into the recess 1A, the resin filling is cured {see paragraph [0049] of Sorg).

As shown in Fig. 2 of Sorg, the lens 4 has a shape that exactly fits into the recess 1A. After the lens 4 is inserted into the recess 1A, the lens 4 is in a well-defined and fixed position in the upper part of the recess. In other words, lens 4 can be inserted into the recess 1A only up to a certain depth and cannot be pressed or forced further downwards into the recess 1A. Thus, a well-defined volume is formed by the lower part of the recess 1A and the underside 4A of the lens 4. Sorg explicitly emphasizes that the amount of resin material 3 that is filled into the recess 1A is set as accurately as possible so that after the insertion of the lens 4, the resin filling 3

exactly fills this volume, which is formed and enclosed by the recess 1A and the underside 4A of the lens 4. Consequently, the resin filling 3 is formed into a shape that is the compliment of the shape of the bottom of the lens 4. The resin 3 is not squeezed so the resin does not generate a force in any direction. Further, after the liquid resin forms the curved shape matching the lens 4, the resin filling 3 is cured . This means that the resin filling 3 is no longer a liquid and is, therefore, no longer deformable, as is Applicant's recited connecting layer 6.

In contrast to Sorg, and as described in detail above, Applicant's connecting layer 6 is not simply disposed between the semiconductor component 2 and the optical device 3, but compressed (and thus deformed) between the semiconductor component 2 and the optical device 3. In other words, an additional force is applied to the semiconductor component 2 and the optical device 3 (via the fixing device (i.e., mounting bars 8 and nuts 9)). In response to this additional force, the compressed deformable connecting layer 6 generates an opposing force against both the semiconductor component 2 and the optical device 3. Sorg fails to teach or suggest such an arrangement.

Bauer discloses an optical sensor package that includes an optical sensor 22 that is attached to the top side of a base substrate 28 (see Fig. 2, and col. 5, lines 1-3 of Bauer). A seal material 46 surrounds the optical sensor 22 of Bauer. A window 48 is bonded to the base substrate 28 of Bauer in a spaced-apart relationship. The spacing distance is determined by the seal material 46 (see col. 5, lines 34-40 of Bauer). A cavity 52, which is formed and enclosed by the base substrate 28, the seal material 46, and the window 48, is filled with an optically transparent curable resin, which may be self curing of may be cured by exposure to heat, ultraviolet light, an electron beam, or the like (see col. 5, line 65 to col. 6, line 2 of Bauer).

The Examiner cites Figs. 2 and 3, col. 5, line 63 to col. 6, line 2, and col. 9, lines 58-67 of Bauer as teaching Applicant's recited connecting layer 6, which allegedly corresponds to the epoxy filling the cavity 52 of Bauer.

The Examiner, however, fails to cite any portion of Bauer as teaching an optical device and a semiconductor component pressing against one another to squeeze a connecting layer arranged therebetween, or that the connecting layer, when squeezed, is configured to generate an opposing force that strives to press the optical device and the radiation coupling area apart", as recited in Applicant's claim 1.

The passages at col. 5, line 63 to col. 6, line 2 of Bauer read "[i]n an embodiment of the present invention, base substrate 28, seal material 46, and window 48 form a hermetically sealed enclosure around optical sensor 22. In another embodiment, cavity 52 is filled with an optically transparent curable resin such as epoxy. The resin may be self curing or may be cured by exposure to heat, ultraviolet light, an electron beam, or the like."

These cited passages of Bauer simply disclose that the various components form a cavity that is filed with a resin. Nothing in the cited passages of Bauer teach or suggest that the window 48 and the optical sensor 22 are pressed together to squeeze the resin in the cavity 52. Instead, the resin of Bauer simply sits on top of the optical sensor 22, while the window 48 is supported by the seal material 46.

Further, there is nothing disclosed in Bauer that teaches or suggests that the resin is compressed or generates a force opposing the compression, which presses back against the window 48 and the optical sensor 22.

The passages at col. 9, lines 58-67 of Bauer read "[t]he window is bonded in block 108. A bead of seal material 46 is made on the top surface of base substrate 28 around the periphery

of bonded wires 32. Seal material 46 is placed far enough from the edge of base substrate 28 so as not to interfere with the installation of clips 30 or with clipless bonding of base substrate 28 to support substrate 24. Window 48 is pressed onto seal material 46. In a preferred embodiment, seal material 46 includes an epoxy sealant which can be thermal cured or cured by exposure to ultraviolet light. For thermally cured seals, the package is heated prior to bonding window 48 onto base substrate 28 to prevent pressure build up due to expanding gas within cavity 52."

These cited passages of Bauer simply disclose how the seal material 46 and the window 48 are attached to the base substrate 28 to produce the cavity 52. Again, nothing in the cited passages of Bauer teach or suggest that the window 48 and the optical sensor 22 are <u>pressed</u> together to squeeze the resin in the cavity 52, or that the resin is in any way compressed or generates a force opposing the compression, which presses back against the window 48 and the optical sensor 22.

Therefore, Bauer also fails to teach or suggest "wherein the optical device and the semiconductor component are fixed relative to one another and pressed against one another <u>to squeeze</u> the connecting layer arranged therebetween" and "wherein the connecting layer, when squeezed, is <u>configured to generate an opposing force</u> that strives to press the optical device and the radiation coupling area apart", as recited in Applicant's claim 1. Consequently, Bauer fails to remedy the above-described deficiencies of Sorg.

In view of the foregoing, Applicant submits that Sorg and Bauer, whether taken alone or in combination, fail to teach or suggest the subject matter recited in independent claim 1. Accordingly, claim 1 is patentable over Sorg and Bauer under 35 U.S.C. §103(a).

Claim 10 recites limitations similar to claim 1 and is, therefore, deemed to be patentably distinct over Sorg and Bauer for at least those reasons discussed above with respect to independent claim 1.

Dependent claims

Claims 2-4, 6-9, 11-13, and 16-17, which depend from independent claims 1 and 10, incorporate all of the limitations of the corresponding independent claim and are, therefore, deemed to be patentably distinct over Sorg and Bauer for at least those reasons discussed above with respect to independent claims 1 and 10.

Rejection of claims 5, 14, and 15 under 35 U.S.C. §103(a)

The Office Action states that the combination of Sorg, Bauer, and Nakagawa teaches all of Applicant's recited elements.

Sorg and Bauer have been previously discussed and fail to teach or suggest the subject matter recited in Applicant's independent claims 1 and 10.

Because Sorg and Bauer fail to teach or suggest the subject matter recited in Applicant's independent claims 1 and 10, and because Nakagawa fails to teach or suggest any of the elements of independent claims 1 and 10 that Sorg and Bauer are missing, the addition of Nakagawa to the reference combination fails to remedy the above-described deficiencies of Sorg and Bauer.

Claims 5, 14, and 15, which depend from independent claims 1 and 10, incorporate all of the limitations of the corresponding independent claim and are, therefore, deemed to be

patentably distinct over Sorg, Bauer, and Nakagawa for at least those reasons discussed above with respect to independent claims 1 and 10.

Conclusion

In view of the foregoing, reconsideration and withdrawal of all rejections, and allowance of all pending claims is respectfully solicited.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

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